
EXCITATION FUNCTIONS AND PRODUCTION RATES OF RADIONUCLIDES PRODUCED IN THE PROTON BOMBARDMENT OF PR AND LA

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The excitation functions of 17 radionuclides produced in the interaction of protons with ¹⁴¹Pr have been measured from threshold up to 100 MeV. For this purpose stacks of Pr foils were irradiated followed by off-line gamma-ray spectroscopy with a calibrated HPGe detector system. For the interaction of protons with ¹³⁹La, similar activation measurements were performed up to an incident energy of 20 MeV.

The main interest of these measurements is to optimise the production of the radionuclides ¹³⁹Ce and ¹³⁹Pr. The single strong 166 keV gamma line of ¹³⁹Ce (half-life of 137.6 days) makes it an ideal calibration source for SPET equipment. The optimum target configuration for its production is a tandem target with Pr in the higher-energy slot and La in the lower-energy slot. The radionuclide ¹³⁹Pr partially decays by positron emission and finds application in PET. It can be used to label human serum albumin (HSA) which allows the quantifying of the metabolism of tumours. This study investigates its production via the precursor ¹³⁹Nd, which can be radiochemically separated from the Pr target matrix.

The measured data are compared with theoretical hybrid model predictions by means of a recent version of the code ALICE-IPPE.